Rates, Patterns, Causes, and Costs of Hospitalization of Nursing Home Residents: A Population-Based Study

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ABSTRACT

Objectives. Hospitalization of nursing home residents is a growing, poorly defined problem. The purposes of this study were to define rates, patterns, costs, and outcomes of hospitalizations from nursing homes and to consider implications for reducing this problem as part of health care reform.

Methods. Communitywide nursing home utilization review and hospital discharge data were used to define retrospectively a cohort of 2120 patients newly admitted to nursing homes; these patients were followed for 2 years to identify all hospitalizations. Resident characteristics were analyzed for predictors of hospitalization. Charges and outcomes were compared with hospitalization of community-dwelling elders.

Results. Hospitalization rates were strikingly higher for intermediate vs skilled levels of care (566 and 346 per 1000 resident years, respectively). Approximately 40% of all hospitalizations occurred within 3 months of admission. No strong predictors were identified. Length of stay, charges, and mortality rates were higher than for hospitalizations from the community.

Conclusions. Hospitalizations from nursing homes are not easily predicted but may in large part be prevented through health care reforms that integrate acute and long-term care. (*Am J Public Health.* 1994;84:1615–1620)

Introduction

The elderly population experiences not only disproportionately high rates of admission to hospitals and nursing homes but high rates of transfer between these settings. Transfer from hospitals to nursing homes has been extensively studied during the past 2 decades.[1,2] However, while there have been studies involving selected institutions,[3–8] there have been virtually no population-based studies of transfers from nursing homes to hospitals in the United States. The magnitude of the problem is substantial: the 1977 and 1985 National Nursing Home Surveys reported, respectively, 339 500 and 430 200 discharges to hospitals, resulting in estimated annual ratios of 242 and 265 hospitalizations per 1000 long-term care beds.[9,10] Such hospitalizations are costly[11] and potentially detrimental to frail elderly people[12,13]; hence, they are important to health services research and policymaking.

The dearth of population-based studies of hospitalization from nursing homes may be ascribed in part to the lack of data systems that link hospital and nursing home use. This, in turn, is a reflection of the historic separation between financing and organization of acute and long-term care in the United States.[14,15] The present study used unique computerized data sets available on all nursing home admissions and hospitalizations in the early 1980s for a defined geopolitical area. The purposes were to determine rates, predictors, causes, and costs of hospitalization of nursing home residents and to consider strategies for reducing these occurrences as part of national health care reform.

Materials and Methods

Setting

The setting for the study, Monroe County, New York, is an urban-suburban-rural jurisdiction centered on the city of Rochester. Table 1 compares selected characteristics for Monroe County and the country at large in the early 1980s. The ratio of general hospital beds per 1000 persons was somewhat smaller in Monroe County, while the ratio of nursing home beds per 1000 elderly persons (those more than 65 years of age) was slightly higher. At the time of this study, approximately 30% and 70% of nursing home beds were classified as intermediate care and skilled care, respectively, in both Monroe County and the country as a whole.[16] Specifically, there were 33 licensed nursing homes in Monroe County in 1982, all of which included skilled care beds (approximately 3600) and 9 of which included intermediate care beds (approximately 1400). (Intermediate and skilled care facilities are defined in the Appendix, and the differences between the two are described. With passage of the 1987 Omnibus Budget Reconciliation Act nursing home reform legislation, the skilled nursing facility and intermediate care

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TABLE 1—Population and Hospital and Nursing Home Bed Provision: Monroe County, New York, and the United States

	Monroe County	United States
Population[a]	702 000	226×10^6
Population >65 years of age[a] (%)	77 000 (11)	25.5×10^6 (11)
Hospital beds per 1000[b]	3.6	4.5
Nursing home beds[b]	4946	1.4×10^6
Nursing home beds per 1000 people >65 years of age[b]	65	60
Skilled nursing beds, %	70	66
Intermediate care beds, %	30	34

[a]1980 US census.
[b]1982 statistics, Finger Lakes Health Systems Agency and reference 16.

TABLE 2—Hospitalizations among Cohorts of Nursing Home Admissions during the 2-Year Follow-Up Period

	Skilled Nursing Facility Cohort	Intermediate Care Facility Cohort
Nursing home admissions, no.	1700	420
Any hospitalizations, no. (%)	451 (26.5)	175 (41.7)*
1 hospitalization	315 (18.5)	119 (28.3)*
2 hospitalizations	95 (5.6)	44 (10.5)*
3+ hospitalizations	41 (2.4)	12 (2.9)
Total hospitalizations	647	245
Total resident-years	1869	433
Hospitalizations per 1000 resident-years	346	566*

*$P < .001$ (for difference between rates for skilled nursing facility and intermediate care facility residents).

facility designations have been replaced by the single designation of residential health care facility for all nursing home beds.[17])

Design and Data

A retrospective cohort design was used in which all patients newly admitted to nursing homes in the county during a single calendar year (1982) were identified and followed for 2 years or until death to ascertain and analyze all episodes of transfer to acute hospitals.

The study population consisted of 2120 nursing home patients admitted between January 1 and December 31, 1982 (1700 and 420, respectively, to skilled and intermediate levels of care). The average length of stay during the 2-year period of follow-up was 402 days for the cohort of skilled nursing facility residents and 376 days for the cohort of intermediate care facility residents.

The principal source for identifying and characterizing the study cohort and for ascertaining hospitalizations was the computerized utilization review file maintained by the Monroe County Long Term Care Program, one of the first community-wide long-term care case management agencies in the country. The program was responsible for tracking all nursing home admissions and discharges in the county between 1977 and 1985.[18] Physical function and mental and behavioral status data were based on the Disability Measurement Scale (DMS-1) utilization review scale in routine use in nursing homes in New York State in the 1970s and early 1980s.[19] Baseline chronic medical conditions for cohort members were obtained by hand from utilization review forms maintained by the Genesee Valley Medical Foundation, a nonprofit agency that conducts, under contract, utilization reviews in nursing homes in Monroe County. These conditions were classified into broad disease categories developed for an earlier study of nursing home utilization in Monroe County.[20]

Discharge diagnoses, lengths of stay, and charges and outcomes of hospitalizations were obtained from the uniform billing forms routinely used by all hospitals in New York State. These forms, obtained through cooperative arrangements with all eight acute care hospitals in the county, accounted for all hospitalizations in the cohort. For comparison with hospitalizations among the community-dwelling population more than 65 years of age, computerized uniform billing form data were obtained from the Rochester Area Hospital Experimental Payment Program, which was in effect during the 1980s.[21] (The uniform billing form provides total dollar charges but not costs; therefore, we report comparative charges data. Because the hospitalizations from nursing homes and from the community involve the same hospitals, the relation of costs to charges was presumed to be similar for the two groups.)

Analysis

Overall rates of hospitalization and rates per 1000 resident-years were computed. Analyses for predictors of hospitalization were conducted separately for skilled nursing facility and intermediate care facility cohorts. Univariate analyses (with chi-square tests for significance) were performed to determine associations between demographic, medical, and functional status characteristics present at admission to nursing home and subsequent hospitalization. Stepwise multiple logistic regression analyses were performed to determine combinations of predictors of hospitalization (including any interactions) among admission characteristics; analyses were repeated for prediction of multiple hospitalizations. Distribution of hospitalizations by principal discharge diagnosis, length of stay, charges, and status at discharge (dead or alive) were computed for all hospitalizations and for those within each of the three age subgroups: 65 through 74, 75 through 84, and 85+ years. These data were compared with information on hospitalizations of people more than 65 years old living in the community.

Results

A total of 892 hospitalizations occurred among the 2120 subjects (a computed rate of 387 hospitalizations per 1000 resident-years). Table 2 summarizes overall frequency and rates of hospitalization for the skilled nursing facility and intermediate care facility cohorts. The percentages of residents experiencing at least one hospitalization during the 2-year follow-up period differed markedly by

level of care: 26.5% for skilled nursing facility residents vs 41.7% for intermediate care facility residents. Some 8% of skilled nursing facility and 13% of intermediate care facility residents experienced multiple discharges to a hospital. After adjustment for time at risk, the difference between the two cohorts persisted, with rates of 346 (skilled nursing facilities) and 566 (intermediate care facilities) total hospitalizations per 1000 resident-years. Cumulative percentages of hospitalization over time, for those ever hospitalized, are shown in Table 3. Graphs (not shown) were quite similar for the two groups, with the skilled nursing facility curve rising slightly faster (i.e., having a slightly heavier concentration of hospitalizations in the first 60 days). Approximately 40% of hospitalizations occurred within the first 90 days, and roughly three quarters within the first year, in each group.

TABLE 3—Number, Percentage, and Cumulative Percentage of Initial Hospitalizations among Admission Cohorts of Nursing Home Residents, by Time Intervals from Day of Nursing Home Admission

Time Interval from Admission, d	Skilled Nursing Facility Cohort			Intermediate Care Facility Cohort		
	No.	%	Cumulative %	No.	%	Cumulative %
1–30	81	18.0	18.0	25	14.3	14.3
31–60	51	11.3	29.3	19	10.9	25.2
61–90	41	9.1	38.4	20	11.4	36.6
91–180	84	18.6	57.0	34	19.4	56.0
181–360	87	20.0	77.0	25	14.3	70.3
361–540	57	12.6	89.6	25	14.3	84.6
541–730	50	11.1	99.7	27	15.4	100.0

TABLE 4—Percentage of Skilled Care and Intermediate Care Nursing Home Residents with One or More Hospitalizations during the 2-Year Follow-Up, by Selected Admission Characteristics

	No. with Characteristic (% with Hospitalization)	
	Skilled Nursing Facility Admissions	Intermediate Care Facility Admissions
All admissions	1700 (26.5)	420 (41.7)
Admitted from		
Home	304 (23.4)	171 (42.1)
Hospital	1160 (27.1)	140 (42.9)
Other institution	236 (26.3)	109 (39.5)
Resident age, y		
<65	92 (17.4)	30 (36.7)
65–74	254 (24.8)	50 (52.0)
75–84	603 (28.9)	150 (42.7)
85+	751 (26.2)	190 (38.9)
Resident sex		
Female	1264 (25.4)	323 (44.0)
Male	436 (29.9)*	97 (37.1)
Chronic medical condition		
Arthritis	367 (27.8)	131 (43.5)
Cardiac	695 (29.1)	197 (43.7)
Cerebrovascular	312 (28.2)	47 (40.4)
Chronic obstructive pulmonary disease	120 (27.5)	39 (53.8)
Dementia	464 (27.8)	79 (38.0)
Depression	84 (35.7)	46 (50.0)
Diabetes	232 (30.6)	54 (44.4)
Gastrointestinal	109 (33.9)	27 (48.1)
Hip fracture	237 (25.7)	34 (47.1)
On-site medical staff		
Yes	409 (21.8)	168 (44.6)
No	1290 (28.3)*	252 (39.7)

*$P < .05$.

Predictors

Tables 4 and 5 examine the association between individual baseline admission characteristics and subsequent hospitalization. For each category of baseline characteristics, hospitalization rates were compared within the skilled nursing facility and intermediate care facility cohorts. Location from which subjects were initially admitted to a nursing home, whether hospital, home, or another institution, was not associated with greater or lesser risk of subsequent hospitalization in either cohort. There was also little difference within the cohorts in risk of hospitalization among age groups, except for slightly lower percentages for the small number of residents less than 65 years of age. Men had higher rates than women in the skilled nursing facility cohort ($P < .05$). Residents with diabetes, gastrointestinal disease, or depression at the time of admission had somewhat higher risks of subsequent hospitalization in the skilled nursing facility cohort, while intermediate care facility residents with cancer, chronic obstructive pulmonary disease, seizure disorder, or depression had somewhat higher risks of hospitalization; however, chi-square tests comparing each of these rates with those among members of the respective cohorts with other baseline chronic conditions showed P values greater than .10. Within the skilled nursing facility cohort, residents in several large nursing homes with full-time medical staffs experienced lower subsequent rates of hospitalization ($P < .05$). Such relationships were not observed among the intermediate care facility subjects in the same institutions. Analyses by baseline functional status (Table 5), restricted to skilled nursing facility residents, revealed a lower rate of hospitalization for the small number who were totally bedbound ($P < .05$).

In summary, in the skilled nursing facilities, only male gender and absence of on-site medical staff were statistically significant predictors of hospitalization, and even then the differences in rates were not large. Being bedbound was associated with a significant lowering of risk. Source of admission, age group, and chronic medical conditions were not significant. For the intermediate care facilities, there were no significant predictors.

TABLE 5—Percentage of Skilled Care Nursing Home Residents with One or More Hospitalizations during the 2-Year Follow-Up, by Selected Physical, Mental, and Behavior Functions

Functional Status	No. with Characteristic	% with Hospitalization
Ambulation[a]		
1	585	26.6
2	1052	28.0
3 (bedbound)	64	11.0*
Urinary continence[b]		
1	717	23.2
2	288	28.2
3	581	29.6
4 (catheter)	164	23.2
Bathing[a]		
1	117	28.2
2	1279	26.3
3	304	22.7
Assaultive–abusive		
1	1565	26.8
2	91	27.5
3	44	15.9
Wandering		
1	1480	26.3
2	109	27.7
3	111	28.8

Note. Functional status, based on admission assessment data from the DMS-1 instrument,[19] was not analyzed for intermediate care facility residents because most were independent or minimally impaired in functions at the time of the admission assessment.

[a]1 = independent, unimpaired; 2 = partial dependence or impairment; 3 = total dependence or impairment.

[b]1 = no incontinence; 2 = intermittent incontinence; 3 = always incontinent; 4 = indwelling catheter.

*$P < .05$.

Stepwise multiple logistic regression analyses failed to reveal single characteristics or combinations of characteristics, including those listed in Tables 4 and 5, that were any more predictive of hospitalization than the limited associations found in univariate analyses. We were likewise unable to identify any combinations of characteristics predictive of (1) hospitalizations that occurred early vs later in the nursing home stay or (2) multiple hospitalizations.

Causes, Charges, and Outcomes

In Table 6, the most common principal discharge diagnosis groups are compared between hospitalizations that occurred among older persons in nursing homes (n = 808) and those living in the community (n = 24 891). Because the distributions by discharge diagnoses were very similar for hospitalizations from the intermediate care facility and skilled nursing facility cohorts, these data have been combined in the analysis. Noteworthy are the significantly greater proportions of cardiovascular and neoplastic disease and cataract surgery hospitalizations among community-dwelling elderly people and of pneumonia and hip fracture hospitalizations among nursing home residents. Overall average lengths of stay in the hospital were approximately 1 day longer (14.4 vs 13.2) and average charges slightly higher for elderly persons admitted from nursing homes than for those from the community (Table 7). These figures showed interesting reverse trends when analyzed for age subgroups, with the younger nursing home residents and the more elderly community-dwelling persons experiencing the longer and costlier hospitalizations within their respective populations. Within each age subgroup, a higher percentage of patients from nursing homes were dead at discharge from the hospital.

Discussion

A number of excellent literature reviews have focused on acute medical care problems of nursing home residents, with particular emphasis on transfers to acute hospitals.[22,23] The literature is composed largely of short-term studies conducted from the limited perspective of one or more selected hospitals, nursing homes, or patient subsets; thus, it is difficult to apply to an understanding of the problem from the perspective of a general population of nursing home residents. By contrast, the present study, using data available from two concurrent communitywide demonstrations,[18,21] reported rates and patterns of acute hospitalization over a 2-year period among a cohort of all patients newly admitted to nursing homes within a defined population. In brief, the study found a rate of hospitalization that was high relative to rates computed from National Nursing Home Surveys, concentrated within the first 3 months of admission to the nursing home, and most strongly associated with the level of care to which residents were assigned on admission. Within each of the two broad levels of care (skilled and intermediate), resident age, sex, medical conditions, and functional parameters at admission, as well as prior locus (home, hospital, other), were generally not strongly associated with risk of subsequent hospitalization, while the presence of on-site medical staff in large institutions was associated with a lower risk for skilled nursing facility residents. Finally, cost of care, as reflected in hospital charges, and mortality rates were somewhat higher, on average, for hospitalizations of nursing home residents than for hospitalizations of community-dwelling elderly people. How should these findings be interpreted, and what are the policy implications for health service delivery for nursing home residents?

The observed strikingly higher rate of hospitalization in the present study (387 per 1000 resident-years), in contrast with ratios derived from the 1977 and 1985 National Nursing Home Surveys data (242 and 265 per 1000 long-term beds per year), may in part reflect a regional tendency toward higher rates of use of acute hospitals by nursing home residents. Given the relatively low hospital bed to population ratio in Monroe County (Table 1) and the well-recognized overall lower rates of hospital admission in the county throughout the 1980s,[24] this is probably not a major factor. The more likely explanation lies in the different population frames of reference for the respective studies. The Monroe County study population, an admission cohort of nursing home residents, would include a higher percentage of relatively short-stay, potentially unstable subjects at higher risk of acute medical decline and transfer to hospital, while the National Nursing Home Surveys data, based in substantial part on a prevalent population of nursing home residents, would include a greater proportion of long-stay, more stable subjects.[25]

There are several possible reasons for the interesting, seemingly paradoxical finding of higher rates of hospitalization among people admitted to lower levels of nursing home care. A leading possibility is that the lesser degree of medical and nursing supervision for patients at lower levels of chronic care leads to a need to transfer unstable residents to hospitals more often than would be necessary from better staffed skilled nursing facilities (see Appendix). In addition, given the greater prevalence of compromising physical and mental disability among skilled care residents, it may be that heroic medical intervention, including transfer to a hospital in instances of acute illness, is withheld more often among these residents. The withholding of life-saving interventions, including hospitalizations, per the ex-

pressed wishes of older persons in nursing homes has been increasingly discussed and formalized in recent years.[26–28]

The failure to more fully identify individual characteristics or patterns of characteristics predictive of which nursing home residents are most at risk of hospitalization within either the skilled nursing facility or intermediate care facility level of care may be attributable to limitations in the utilization review data used in this study. While utilization review at admission is intended primarily for classifying residents by level of need for assistance with activities of daily living within the nursing home, it is readily acknowledged that baseline utilization review data on medical conditions may be incomplete and do not permit classification of conditions by medical severity,[29] which is clearly a most important factor in risk of hospitalization.[30]

Nursing home residents, like community-dwelling elderly persons,[31] had relatively high overall risks of hospitalization as well as rehospitalization. The somewhat higher average charges and mortality rates and higher proportion of respiratory infections and fractures involved in hospitalizations of those from the nursing home cohort in comparison with those from the community are similar to findings reported elsewhere.[3–6] Recognizing that many nursing home hospitalizations might be avoided by applying relatively unsophisticated acute services on site (e.g., intravenous antibiotics), various earlier studies have estimated that as many as 40% to 50% of these hospitalizations might be preventable.[8,32] Given the substantial costs and frequency of hospitalization of nursing home residents and evidence that these factors may be increasing since implementation of the Medicare Prospective Payment System,[2,22] reducing such hospitalizations becomes a serious policy consideration. (Hospital discharges from Monroe County nursing homes ranged between 900 and 1200 from 1986 to 1990 [L. Varricchio, Finger Lakes Health Systems Agency, written communication, August 1993].)

A number of cost-saving strategies for reducing hospitalizations from nursing homes without compromising quality of care have been demonstrated in recent years. These include employing geriatric nurse practitioners in nursing homes,[33,34] providing financial incentives for primary care physicians and nursing home staff to treat serious acute illnesses on site,[35] offering nursing home residents the opportunity to express their preference with regard to use of acute hospital services in the event of a life-threatening acute illness,[28] and, in larger institutions, establishing an "infirmary" unit for care of serious acute illnesses.[36]

Most of these strategies require modification of traditional staffing and reimbursement for clinical care in nursing homes.[14,37,38] Much neglected in the past, these needs have begun to be met in the form of the 1989 legislation authorizing Medicare reimbursement of nurse practitioners in nursing homes (Public Law 101-239) and the 1993 implementation of increased Medicare fees for physician services in nursing homes.[39] Although these are important enabling steps, it is not likely that reimbursement reform alone, in the absence of organizational reform, will achieve the full potential for reducing transfers from nursing homes to hospitals. In this regard, the proposed inclusion of long-term care in national health care reform[40,41] affords a unique opportunity to overcome our long and costly legacy of separation of the acute and chronic health service sectors, epitomized by frequent transfers of patients between nursing homes and hospitals. Such integration of the delivery system in Great Britain has resulted in far lower rates of hospitalization from long-term care institutions.[15] This approach has been emulated in other societies with comprehensive national health programs[42] and deserves high priority when considering the needs of older Americans as part of national health care reform. □

TABLE 6—Distribution of Hospitalizations of Persons 65 Years of Age or Older from Nursing Homes and from the Community, by Principal Discharge Diagnosis

Principal Discharge Diagnosis	Nursing Home,[a] (n = 808) No.	Nursing Home,[a] (n = 808) %	Community,[b] (n = 24 891) No.	Community,[b] (n = 24 891) %
Cardiovascular*	126	15.6	5 548	22.3
Gastrointestinal tract	107	13.2	2 938	11.8
Pneumonia*	78	9.7	636	2.6
Hip fracture*	76	9.4	590	2.4
Genitourinary tract	59	7.4	1 430	5.7
Neoplasm*	40	5.0	3 119	12.5
Cataract surgery*	38	4.7	1 924	7.7
All other	284	35.1	16 185	35.0

[a]Hospitalizations for nursing home residents less than 65 years old are excluded.
[b]Monroe County, 1983.
*$P < .001$.

TABLE 7—Length of Stay, Charges, and Outcome of Hospitalizations of Persons 65 Years of Age or Older from Nursing Homes and the Community

Age Group, y	Nursing Home[a] No.	Nursing Home[a] Average Length of Stay, d	Nursing Home[a] Average Charge, $	Nursing Home[a] Dead at Discharge, %	Community (1983)[b] No.	Community (1983)[b] Average Length of Stay, d	Community (1983)[b] Average Charge, $	Community (1983)[b] Dead at Discharge, %
65–74	100	14.3	5812	8.0	12 586	11.5	5373	6.0
75–84	342	15.6	6312	13.7	9 046	13.8	5667	8.9
85+	366	13.3	5529	16.7	3 249	17.8	6133	14.1
All 65+	808	14.4	5849	14.4	24 891	13.2	5580	8.1

[a]This analysis does not include hospitalizations among nursing home residents less than 65 years old.
[b]Data on hospitalizations from the community were provided by INFOMED, Inc, an affiliate of the Rochester Area Hospital Corporation.

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APPENDIX—Definitions of Skilled and Intermediate Care Facilities

Skilled Nursing Facility	Intermediate Care Facility
1. Residents with chronic medical conditions and disabilities requiring care of skilled technical/professional personnel	1. Residents with chronic medical or mental conditions requiring health-related institutional services but not skilled care
2. Physician visit at admission and at 30- or 60-day intervals	2. Physician visits at 60- or 90-day intervals
3. Licensed nursing coverage 24 hours a day, including registered nurse supervision during the day shift	3. Supervision by a registered nurse or licensed practical nurse during the day shift
4. Utilization review at regular intervals	4. Utilization review at regular intervals

Source. Adapted, with permission, from Appendix B, "Existing SNF Conditions of Participation and ICF Standards." In: Institute of Medicine. *Improving the Quality of Care in Nursing Homes.* Washington, DC: National Academy Press; 1986. © 1986 National Academy of Sciences.